Problem Set 1

Exercise 1. A six-sided die is thrown. Let event A be 'the number obtained is divisible by 2' and event B be 'the number obtained is divisible by 3'. Draw a Venn diagram to represent these events.

Exercise 2. A biased six-sided die has probabilities $\frac{1}{2}p$, p, p, p, p, 2p of showing 1, 2, 3, 4, 5, 6 respectively. Calculate p. R: $p = \frac{2}{13}$

Exercise 3. By shading or numbering Venn diagrams, determine that the following are valid relationships between events. Prove the relationship using de Morgan's laws.

a) $\overline{\left(\bar{X} \cup Y\right)} = X \cap \bar{Y}$

b) $X \cup \overline{\left(Y \cap Z\right)} = \left(X \cup \bar{Y}\right) \cup \bar{Z}$

Exercise 4. Calculate the probability of drawing an ace or a red honour card (ace, king, queen, jack or 10) from a pack of cards.

R: 3/13

Exercise 5. An urn contains three white balls and four black balls. Two balls are successively drawn from this urn without replacement. We consider the events:

A : the first ball drawn is white,

B : the second ball drawn is white.

What is the probability that the second drawn ball will be white if the first is white $P\left(B|A\right)$? R: 1/3

Exercise 6. A laboratory blood test is 99 percent effective in detecting a certain disease when it is, in fact, present. However, the test also yields a "false positive" result for 1 percent of the healthy persons tested. (That is, if a healthy person is tested, then, with probability 0.01, the test result will imply he or she has the disease.) If 0.5 percent of the population actually has the disease, what is the probability a person has the disease given that his test result is positive?

R: 0.3322